What is claimed is:

1. A method of evaluating the abruptness of a junction in a semiconductor sample, the method comprising:

directing an intensity modulated pump beam and a probe beam on the sample surface;

obtaining two or more measurements by analyzing the reflected probe beam, each measurement composed of an in-phase (I) value and a quadrature (Q) value where at least one measurement is obtained after changing the relative position of the pump and probe beams on the sample surface; and

deriving an abruptness value for the junction as a function of the I and Q values included in the measurements.

2. A method as recited in claim 1 that further comprises:

deriving the slope of a line in the I-Q plane fitted to the I and Q values that compose the measurements; and

using the derived slope in combination with a previously derived slope associated with a calibration sample having a known junction abruptness.

3. A method as recited in claim 1, wherein one of the measurements is obtained when the pump and probe beams are overlapping.

4. A method as recited in claim 1, where the I and Q value are compared to I and Q values obtained from one or more calibration samples having known junction abruptness values.

5. A method of evaluating the abruptness of a junction in a semiconductor sample comprising:

directing an intensity modulated pump beam to a spot on the sample to periodically excite a region of the sample;

directing a probe beam to a first measurement spot within the periodically excited region of the sample;

monitoring the reflected probe beam and generating first output signals;

directing the probe beam to a second measurement spot within the periodically excited region of the sample, said second measurement spot being spaced from the first measurement spot;

monitoring the reflected probe beam and generating second output signals; and

filtering and processing the output signals to create in-phase (I) and quadrature (Q) components and analyzing the I and Q components derived from the two different measurement spots to determine the abruptness of the junction.

6. A method as recited in claim 5, wherein one of the measurement spots is coincident with the pump beam spot.

7. A method as recited in claim 5, wherein the step of processing includes analyzing the slop of a line fit to the I and Q components derived from the measurement points as plotted in I and Q space.

8. A method of evaluating the abruptness of a junction in a semiconductor sample, the method comprising:

focusing an intensity modulated pump beam and a probe beam on the sample surface;

obtaining two or more measurements by analyzing the reflected probe beam, each measurement composed of an in-phase (I) value and a quadrature (Q) value where each at least one measurement is obtained after changing the power density of the pump beam on the sample surface; and

deriving an abruptness value for the junction as a function of the I and Q values included in the measurements.

9. A method as recited in claim 8 that further comprises:

deriving the slope of a line in the I-Q plane fitted to the I and Q values that compose the measurements; and

using the derived slope in combination with a previously derived slope associated with a calibration sample having a known junction abruptness.

10. A method as recited in claim 8, wherein the power density of the pump beam is changed by changing the spot size of the pump beam on the sample.

11. A method as recited in claim 8, wherein the power density of the pump beam is changed passing the pump beam through a filter.

12. A method of evaluating the abruptness of a junction in a semiconductor sample comprising:

directing an intensity modulated pump beam to a spot on the sample to periodically excite a region of the sample;

directing a probe beam to a measurement spot within the periodically excited region of the sample;

monitoring the reflected probe beam and generating first output signals;

changing the power density of the pump beam;

monitoring the reflected probe beam and generating second output signals; and

filtering and processing the output signals to create in-phase (I) and quadrature (Q) components and analyzing the I and Q components derived from the two different power densities to determine the abruptness of the junction.

13. A method as recited in claim 12, wherein the step of processing includes analyzing the shape of a line fit to the I and Q components derived from the measurement points as plotted in I and Q space.

14. A method as recited in claim 12, wherein the power density of the pump beam is changed by changing the cross-sectional size of the pump beam.

15. A method as recited in claim 12, wherein the power density of the pump beam is changed passing the pump beam through a filter.

16. A method of evaluating the depth of a junction in a semiconductor sample, the method comprising:

directing an intensity modulated pump beam and a probe beam on the sample surface;

obtaining one or more measurements by analyzing the reflected probe beam;

filtering and processing the one or more measurements to obtain respective quadrature (Q) components; and

deriving one or more values for the junction as a function of the one or more quadrature (Q) components.

17. A method as recited in claim 16, in which a lookup table is used to obtain a depth value from the quadrature (Q) components.

18. A method of characterizing a semiconductor sample, the method comprising:

directing an intensity modulated pump beam and a probe beam on the sample surface;

obtaining two or more measurements by analyzing the reflected probe beam, where one measurement follows the previous measurements after a predetermined period of time;

fitting the resulting curve by using a function with two or more variables; and

characterizing the incompleteness of an annealing process and/or the presence of surface states by evaluating the delay curve.

19. A method as recited in claim 18, in which the change in the function is calculated as the value of the exponential curve sampled at an initial time divided by the

value of the exponential curve sampled at a time corresponding to the predetermined time period.

20. A method of evaluating two or more properties of a junction formed in a semiconductor sample, the method comprising:

directing an intensity-modulated pump beam and a nonmodulated probe beam on the surface of a sample;

analyzing the in-phase (I) and quadrature (Q) components of the reflected probe beam intensity; and

deriving two or more properties of the junction based on the measured Q and I components.

21. A method as recited in claim 20, that further comprises:

deriving the slope of a line in the I-Q plane fitted to the I and Q components; and

using the derived slope in combination with a previously derived slope associated with a calibration sample having a known junction abruptness.